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Nonstick Pollution Sticks in People

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High concentrations of a chemical used in the production of well-known nonstick surfaces have turned up in people living near a Teflon-manufacturing plant in West Virginia. The data emerge from the first government-sponsored epidemiological study of the chemical, known both as perfluorooctanoic acid (PFOA) and C-8.

[IMAGE] People from Ohio communities with the most PFOA-tainted water are encouraged to avoid using tap water for drinking, cooking or even for brushing their teeth.

Since 2000, the Environmental Protection Agency has been investigating potential risks of this very persistent compound. Once in the environment, it doesn't appear to break down ever. Trace amounts have shown up in the blood of most U.S. residents tested, although EPA has yet to identify the source. The agency has posted information on its Web site indicating that "PFOA can cause developmental and other adverse effects in laboratory animals," including cancer.

One source of PFOA in blood that DuPont researchers have all but ruled out is Teflon-coated cookware. In a new study, researchers found that PFOA residues were "not detected in over 40 extraction tests on nonstick cookware under test conditions simulating cooking and prolonged food or consumer contact." That same study, in the June 1 *Environmental Science & Technology*, did find leaching of PFOA from certain stain-guard treatments of carpeting and upholstery, suggesting that some consumer products might be notable environmental sources of the chemical.

The new study measured blood concentrations of PFOA in 326 people from four communities in southeastern Ohio, across the river from DuPont's Teflon-making Washington (W.Va.) Works facility. Average blood concentrations of PFOA in the communities ranged from 298 to 369 parts per billion (ppb). These amounts are more than 60 times those found in most people, notes study leader Edward A. Emmett, a physician and toxicologist at the University of Pennsylvania School of Medicine. In general, the new study by Emmett's team found that

PFOA concentrations in an individual's blood tended to be about 105 times that in the water that the person had been drinking.

Owing to the limited number of people examined for the study, the researchers made no effort to look for a possible elevation in rates of cancer or birth defects among the study volunteers, Emmett says. However, his team did look for, and failed to find, an increased incidence of liver, kidney, or thyroid disease. Finding no indication of liver disease in these people "may be somewhat comforting" because lab rats treated with PFOA develop liver toxicity before developing liver tumors.

Water wells serving all four communities are contaminated with PFOA from the Teflon plant, notes EPA. Indeed, the agency possesses data from DuPont indicating PFOA contamination for more than 2 decades in the water supplies serving several West Virginia and Ohio communities. Although two of the Ohio communities are close enough to the plant to be affected by air emissions of the chemical, if they occur, blood concentrations of PFOA were actually a bit higher in people from the more-distant communities. This observation argues strongly "that the major source of the C-8 [PFOA] in the residents' bodies is the contaminated water," Emmett says. Further strengthening that conclusion, his team found that people who regularly drank bottled, cistern, or spring water had a median blood concentration of only 55 ppb PFOA in their blood.

At an Aug. 15 town hall meeting, Emmett told residents of the four Ohio communities: "I urge parents within the study area to consider taking appropriate measures to reduce C-8 levels in their children's blood," such as by switching to bottled water for all drinking, cooking, and tooth brushing. Owing to the pollutant's capability of causing problems such as birth abnormalities in lab animals, Emmett advised "the same precaution for pregnant women and women of child-bearing age who may wish to become pregnant."

The Little Hocking (Ohio) Water Association provides tap water to an Ohio water district including most of the people who participated in Emmett's study for more than a year. This water association had asked DuPont to provide PFOA-free water to people living near the Teflon plant, notes Robert L. Griffin, general manager of the water association. The Teflon maker refused to do so, he says, until just hours before Emmett reported his team's new PFOA data to the four communities with residents in the study.

DuPont has pledged to supply coupons for free bottled water to the

4,300 Ohio households that Griffin's company serves. Griffin says DuPont has agreed to supply this water for drinking and cooking only until the Teflon maker builds a water-treatment facility that can filter PFOA from the local drinking water.

Water worries

The Little Hocking water district and five others nearby serving some 80,000 people have turned up PFOA groundwater pollution linked to DuPont's Teflon operations. Little Hocking's 12,000 customers have the most-polluted tap water and are the only ones now slated to get the bottled-water coupons.

[IMAGE] DuPont has agreed to buy bottled water for some 12,000 residents whose tap water is contaminated with a pollutant from the company's Teflon-making factory.

In a report to the company's customers, last year, Griffin reported that his water association had "learned... [that] DuPont, in the late 1980s or early 1990s, established a 'community exposure guideline' for C-8 of 1 ppb." EPA has also cited that internal-company guideline. Currently, no state or federal limit exists for the pollutant, Griffin notes, although West Virginia has published a recommended guideline for PFOA in water of 150 ppb. Although PFOA contamination from the Teflon-manufacturing plant affecting the other five water districts do not exceed 1 ppb, Griffin says that Little Hocking tap water "has been as high as 7.2 ppb." His company decommissioned one well because it was producing water with 18.6 ppb, and Griffin told Science News Online that a known plume of PFOA in groundwater could eventually taint the district's wells with significantly higher concentrations of the chemical.

EPA has charged DuPont with knowing about its PFOA-water-pollution problem for decades but neglecting to report it to EPA. The company has argued that it had no legal obligation to do so. Last year, EPA charged that DuPont's failure to report the PFOA pollution of water outside its plant and substantial concentrations of the Teflon chemical in workers' blood violated the Toxic Substances Control Act (SN: 7/31/04, p. 78).

This past Feb. 28, a judge approved a \$107.6 million settlement of a 3-year-old class action suit against DuPont by residents near the Washington Works over the water pollution. As part of that accord, the company agreed to build "state-of-the-art water treatment systems" for the water districts including Little Hocking.

DuPont also pledged to provide the same technology or its equivalent to residents in the affected communities who rely on private wells as their sole source of drinking water. The settlement also will fund an independent study to see whether PFOA is toxic to people and to conduct long-term health monitoring of residents that had received water from the six tainted community-water systems.

Data to date

A person's body readily absorbs PFOA but doesn't readily excrete it, says Tim Kropp, a toxicologist with the Environmental Working Group, a Washington, D.C., advocacy group that has been unearthing documents on the health effects and environmental fate of nonstick chemicals. PFOA's half-life in the body is 4.4 years. What that means, Kropp says, is that even if no additional PFOA exposure occurred, the body "would take about 2 decades to get rid of about 99 percent of it."

In Emmett's study, among people living near the DuPont plant but not working there, young children and older adults tended to have the highest body burdens of the pollutant. For instance, although the median PFOA concentrations was 320 ppb in women and 346 ppb in men, the median among children under 6 was around 500 ppb, and concentrations in some 25 percent of them exceeded 800 ppb. Similarly, the median for people over 60 was 500 ppb but many had blood concentrations "in the thousands," Emmett says. That's bad news, he said at the town hall meeting in Ohio, because these are the most physically vulnerable segments of society.

Another apparent at-risk group: people who eat lots of homegrown produce. Emmett's team found that among Little Hocking water users, those who ate no homegrown fruits and vegetables had median PFOA concentrations of 295 ppb. However, those eating up to 20 servings per week of garden produce had median concentrations of 420 ppb, and the value climbed to 469 ppb for those who ate even more home-grown fruits and veggies.

Whatever the reason for this association, he notes, from a public health standpoint, it's worrisome. That's because physicians and nutritionists typically urge people—especially children and the elderly—to eat plenty of fruits and vegetables.

Concludes Emmett, West Virginia's "so-called 'safe level' of C-8 of 150 ppb in water may need revision" in light of the high concentrations of this pollutant showing up in people exposed to

concentrations of only 2 to 7 ppb. With the body's accumulation of the pollutant witnessed in this study, one might expect ingestion of water tainted with 150 ppb PFOA to result in blood concentrations of around 15,000 ppb, says Emmett, "and we simply don't know those levels are safe." Indeed, he adds, his study can't confirm that even the much-lower concentrations seen in Little Hocking residents are safe.

"This study shows that workers are not the only population at risk from PFOA," says Jane Houlihan, who is vice president for research at the Environmental Working Group. "Even trace amounts in water pose risks to residential communities—especially their children and seniors."

Dupont: little concern

In a statement issued by DuPont, its Washington Works manager Bill Hopkins said: "We want to provide residents of the Little Hocking community with the same assurance we have given our own employees—that based on research of DuPont and [others], no human health effects are known to be caused by exposure to PFOA." Hopkins acknowledged in the statement that Emmett's study "raises important questions" about the long-term implications of these exposures. However, he said that DuPont is confident that such issues will be resolved by an independent science panel that was created earlier this year as part of the lawsuit that it settled with area residents.

In February, the company began its own health study of residents near the Teflon factory, probing for signs of any PFOA-triggered disease.

It complements a company study of workers already under way at the Washington Works facility. The first wave of findings from the workers study, reported by the company in January, found no hint of PFOA-related liver disease or cancer. The only apparent adverse impact: a 10 percent elevation in total cholesterol (mostly due to a rise in the so-called bad, low-density lipoprotein fraction) and a rise in blood triglycerides. Both of these changes were seen only in very heavily exposed individuals, people with blood concentrations of PFOA greater than 1,000 ppb.

Finally, DuPont notes that PFOA exposure to community residents should begin falling. The company says it has cut PFOA releases from its Washington Works by 98 percent over the past 6 years and is "aggressively installing" the water-treatment facilities it promised

as part of the class-action settlement earlier this year.

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